

## STORMS AND WEATHER WARNINGS

## WASHINGTON FORECAST DISTRICT

The weather of the month taken as a whole was rather active, being characterized by numerous developments particularly along the middle Atlantic coast.

Advises were issued the morning of the 1st for strong east winds on the Atlantic coast from Delaware Breakwater to Eastport, in connection with a secondary disturbance of increasing intensity over the south Atlantic coast.

At 1:25 p. m. on the 5th when a disturbance of moderate intensity was over eastern North Carolina, warnings were disseminated for increasing easterly winds with overcast weather and rain from Delaware Breakwater to Portland, Me. On the following morning advises were issued for strong winds and gales off the coast from Hatteras to Eastport. Strong winds occurred on the coast from Cape Henry to Hatteras and probably off the middle and north Atlantic coast, although vessel reports are not available to verify this.

When a disturbance was over Hudson Bay on the evening of the 10th, warnings were issued for strong southwest winds on the following day from Sandy Hook to Portland. No verifying velocities were reported but fresh to strong winds occurred.

With a disturbance over the middle Mississippi Valley on the afternoon of the 13th moving rapidly east-northeastward, advisory warnings were ordered for the Atlantic coast from Sandy Hook to Eastport for increasing east winds becoming strong late that night or the following day. This was supplemented on the following morning by the dissemination of southwest storm warnings from Delaware Breakwater to Eastport and on the afternoon of that date warnings were extended southward to Southport, N. C. Strong winds occurred as indicated.

On the morning of the 17th a disturbance of slight but increasing intensity was over North Carolina and moving northeastward, and advises were issued for increasing east winds, Delaware Breakwater to Boston. While this disturbance did not cause strong winds on the immediate coast, vessel reports indicate that strong winds occurred some distance off the coast.

The evening radio bulletin for the north Atlantic coast, issued on Wednesday the 18th, indicated "Increasing southeast shifting to south and southwest winds, becoming strong Thursday night." The disturbance that was over Indiana moved rapidly northeastward by the morning of the 19th, and winds had increased along the northern New Jersey and the Long Island coasts. Storm warnings were immediately ordered from Hatteras to Eastport for strong southwest shifting to west winds with squalls, and strong winds occurred during the day. The warnings were lowered at 10 p. m. of the 19th.

On the morning of the 27th, when a disturbance was over Hudson Bay with a trough extending southward to Georgia, advisory warnings were disseminated for the Atlantic coast from Hatteras to Eastport for fresh south and southwest winds shifting to northwest with squalls. During the afternoon special observations indicated that the disturbance was increasing in intensity and northwest storm warnings were ordered displayed from Cape Hatteras to Provincetown, Mass. The evening of that date southeast warnings were ordered north of Provincetown to Eastport, Me. Strong winds and gales occurred substantially as indicated in the warnings.

With a disturbance off Nantucket on the morning of the 31st apparently increasing in intensity and moving

northward, warnings were ordered from Sandy Hook to Eastport. While the disturbance increased in intensity and moved northward as anticipated, winds did not reach dangerous velocities, as shown by the coast stations.

On the afternoon of the 31st a disturbance of small diameter developed over the South Atlantic States, being central on the evening of that day over eastern Georgia and storm warnings were ordered from Norfolk to Charleston. Winds were strong along the South Carolina coast during the night, but having diminished by the following morning the warnings were ordered down.

Frost warnings were issued for portions of the east Gulf and South Atlantic States on the 1st, 2d, 5th, 6th, 15th, 19th, 27th, 28th, and 30th; and for the Ohio Valley and Tennessee on the 27th, 28th, and 30th. On the 16th and 29th cloudiness prevented the occurrence of frost in portions of the States indicated in the warnings.—*R. H. Weightman.*

## CHICAGO FORECAST DISTRICT

The monthly mean temperature was considerably above the seasonal normal over the entire forecast district; and, while a cold wave was quite general during the first few days of the month, mild weather was almost the rule thereafter, there being few lapses to lower temperature. Cold-wave warnings were issued on the 1st for the areas affected, but other cold-wave warnings during the month were for quite limited localities.

*Storms on Lake Michigan.*—Rather strong winds prevailed on Lake Michigan on a few occasions, and advisory messages were sent to open ports where navigation was maintained.

*Frost warnings.*—No warnings of frost were issued, except for Kansas, where service was begun on the 18th, and to the strawberry growers of southwestern Missouri, warnings being sent to the latter on March 18, 19, and 26.

The most prominent meteorological features of the month were the destructive tornadoes which occurred in the extreme southern portions of Indiana and Illinois and southeastern Missouri on the 18th. Rains and strong shifting winds were predicted for this area, but following the practice of the Bureau, no forecast for tornadoes was made.

Special forecasts were continued each Monday to certain fruit exchanges in the State of Washington covering the area over the Middle States for the protection of apples in transit, and these advises were discontinued for the season on March 23. The following letter was received from the Northwestern Fruit Exchange, Wenatchee, Wash.:

We wish to take this opportunity of thanking you most sincerely for the service you have given us during this shipping season.

We are endeavoring in every way possible to handle the transportation of our Northwestern apples with the least possible loss. The service that you have given us has enabled us in a great many instances to prevent loss by placing shipments under the proper protective service.

Other special forecasts and warnings were issued at different times to various interests in the district, covering the shipment of perishable goods.—*H. J. Cox.*

## NEW ORLEANS FORECAST DISTRICT

Moderate weather conditions prevailed over this district during the month. Cold-wave warnings were issued on the morning of the 13th for Oklahoma, extended at night over the northwest portion of East Texas and were extended on the morning of the 14th over Arkansas, the

remainder of East Texas, and northern and western Louisiana. The warning was only partially verified. Frosts occurred on a few dates for which warnings were issued.

Northwest storm warnings were issued for the eastern portion of the Texas coast, and small-craft warnings for the western part on the morning of the 14th, and verifying velocities occurred within the period of the display. No general storm occurred without warnings.—*I. M. Cline.*

#### DENVER FORECAST DISTRICT

Disturbances that had developed on the Plateau, or had advanced from that portion of the Pacific coast immediately to the northwest, were present in the southern portion of the Rocky Mountain region during most of the time from the 5th to the 13th and from the 26th to the end of the month. These LOWs were attended, at some time during their passage eastward, by snow or rain in nearly all parts of the district except southeastern New Mexico, although the precipitation east of the Continental Divide was everywhere extremely light. On the 16th–17th a disturbance advanced southward along the eastern Rocky Mountain slope to northern Texas, where it recurved to the northeastward. It was attended by light snow in Colorado on the 17th and by violent and highly destructive local storms in southern Illinois when it crossed that region on the following day.

Warnings of moderate cold waves in eastern Colorado were issued on the mornings of the 10th, 13th, and 17th. The first of these was partially, and the last two were fully verified.

Warnings of freezing temperatures and frosts which were generally verified were issued as follows: Freezing temperature in southern New Mexico and southeastern Arizona on the 11th and 13th, and in extreme southeastern New Mexico on the 14th, 15th, 18th, and 19th. Warnings of frosts in southwestern Arizona on the 11th and 13th; in south-central New Mexico on the 14th, 15th, 18th, and 19th; in southern New Mexico on the 16th, and in the western valleys of Colorado on the 31st.

Owing to the extreme dryness on the eastern slope of the Rockies in Colorado, where some fires had already started, a fire-weather warning of strong shifting winds during the following day was issued for this portion of the State on the evening of the 31st, when a disturbance was advancing northeastward from Utah. The warning was fully justified.—*J. M. Sherier.*

#### SAN FRANCISCO FORECAST DISTRICT

As a rule the month of March was a relatively quiet one in the Pacific States Forecast District. Storm warnings were ordered on but two days, the 14th and 30th, for the north coast; on one day, the 29th, for the coast south of San Francisco; and on one day, the 30th for the San Francisco Bay region. Frost warnings were ordered for parts of California daily from the 6th to 13th and for Washington and Oregon for the 6th, 7th, and 8th, and the 23d, 25th, 28th, and 29th. These forecasts were verified in practically all instances, but the extent of damage from frosts is not definitely known. The early issue of frost warnings in Washington and Oregon was necessary because the growing season was considerably ahead of normal.

Considered from the standpoint of forecasting, the month was an interesting one, especially for California,

where except for two periods, namely the 7th to the 10th and the 26th to the 31st, inclusive, when rain fell in nearly all parts of the State, fair weather was general. The rainfall was heavy and general during the period beginning the 26th and continuing into the month of April. The occurrence of these rains was more than likely due to the abnormal developments and displacements of the area of high barometric pressure that normally is found off the California coast. In the former instance of rains in California, i. e., the 7th to 10th, this area of high barometric pressure was far north of its normal position, and its major axis paralleled the meridians, whereas usually its major axis lies more or less east to west, and with its eastern periphery impinging on the coast. In this instance, an area of low barometric pressure formed over Nevada and caused light to moderate, though general, rains in California. Beginning on the 26th, however, there was a radical departure from the normal pressure situation over the ocean. The area of high barometric pressure, normally central near latitude 32° and longitude (west) 140°, retreated westward approximately 20° in longitude, and permitted LOWs from the north Pacific to advance southeastward and bring California under their influence. The result was that a series of LOWs, the like of which had not occurred previously for a long time, crossed the coast line south of the Oregon border, and caused general and heavy rains throughout California. Occurrences such as this indicate that a knowledge of the behavior of this area of high barometric pressure is essential to determining the times of those changes from the usual fair-weather types of isobaric patterns which bring on periods of unsettled weather and rains in California.—*E. H. Bowie.*

#### RIVERS AND FLOODS

By H. C. FRANKENFIELD, in Charge of Division

With but two exceptions the floods of March in the larger rivers were very moderate, and all, aside from an ice-gorge flood in the Missouri River near Niobrara, Nebr., occurred east of the Mississippi River. The usual statistical data will be found in the table at the end of this report.

The most severe flood of the month occurred in the Connecticut River and its tributaries. Moderately heavy rains fell on March 28 and 29 but the temperatures had been high for several days, and there was a snow cover over the upper drainage basin ranging in depth from 7 to more than 20 inches, probably equivalent to at least 2 inches of water, so that with the rainfall there must have been approximately 3 inches of water, a sufficient quantity to have caused a severe flood at this time of the year regardless of other conditions. Reports, official and otherwise, indicate that disastrous floods occurred throughout New Hampshire and Vermont and in the smaller streams of the Adirondack region of New York. In the lower Connecticut River Valley the flood crest was not an unusual one for the time of the year and virtually no damage resulted. In the upper valley the damage was quite severe but it was impossible to obtain any estimates as to the amount thereof. The town of Randolph, Vt., suffered severely, two dams and 6 houses having been swept away, with resulting damage amounting to about \$50,000.